Dec. 7, 1954 E. W. PETERSON 2,696,539

DUAL CIRCUIT ELECTRICAL SAFETY DEVICE

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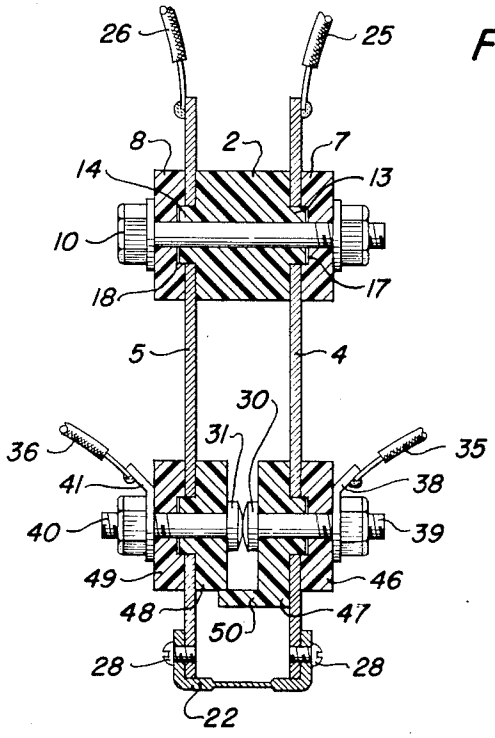


Fig. 1

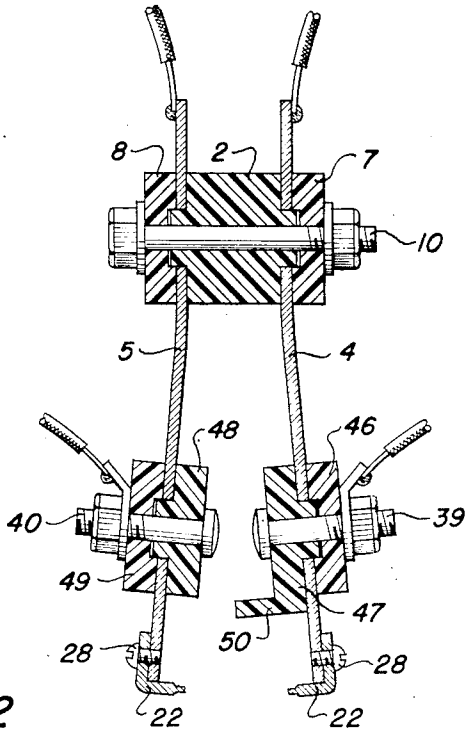


Fig. 2

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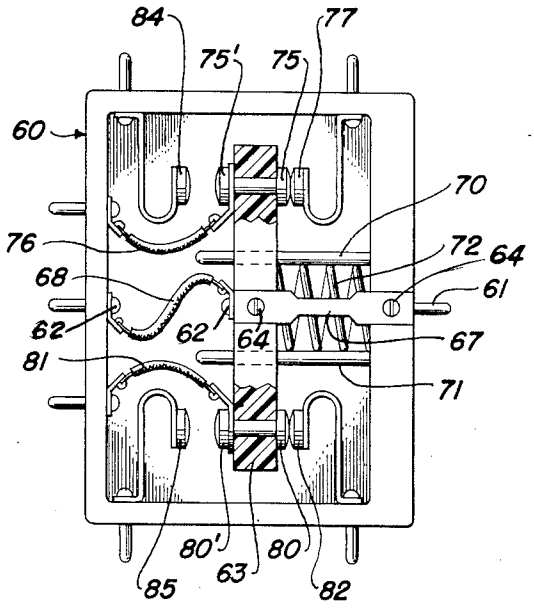


Fig. 3

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2,696,539

Patented Dec. 7, 1954

2,696,539

DUAL CIRCUIT ELECTRICAL SAFETY DEVICE

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Application April 30, 1953, Serial No. 352,145

4 Claims. (Cl. 200—114)

The present invention relates to electric circuit interrupting means and more particularly to means for interrupting practically simultaneously a plurality of electric circuits.

In various instances it is desirable to simultaneously interrupt a plurality of electric or electronic circuits in order to minimize the possibility of current from one interrupted circuit diverting to another circuit. For example, if a first circuit is interrupted by overload current blowing a fuse therein, the current may in some instances divert to and flow through some secondary circuit, with resultant improper circuitry, malfunction and equipment damage. The difficulty is not entirely overcome by utilizing a magnetic relay or relays to open a secondary circuit in response to interruption of a primary circuit for, with such an expedient, there is objectionable time lag between interruption of the primary circuit and opening of a secondary circuit, due to relatively slow magnetic field decay in relay solenoids and inertia of relay armatures and associated parts.

The present invention aims to overcome the above and other difficulties or disadvantages by providing new and improved means for interrupting or opening rapidly and practically simultaneously a plurality of electric circuits.

An object of the present invention is to provide new and improved means for interrupting a plurality of electric circuits.

Another object of the invention is to provide improved means for opening one or more secondary electric circuits practically simultaneously with the opening of a primary electric circuit.

Another object of the invention is to provide improved circuit opening means which is of relatively simple, rugged and inexpensive construction.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention and various modifications thereof have been chosen for purposes of illustration and description. The preferred embodiment and the modifications are not intended to be exhaustive nor to limit the invention to the precise forms disclosed. They are chosen and described in order to best explain the principles of the invention and their application in practical use to thereby enable others skilled in the art to best utilize the invention in various embodiments and modifications as are best adapted to the particular use contemplated.

In the accompanying drawings,

Fig. 1 is a longitudinal sectional view showing the present device in closed current-conducting relationship;

Fig. 2 is a longitudinal sectional view showing the device of Fig. 1 in opened or circuit-interrupting relationship; and

Fig. 3 is a plan view, partly in section, showing another form of the invention.

As shown more particularly in Figs. 1 and 2, the present invention comprises an insulating member **2**, to which are secured in spaced relationship a pair of conducting elements **4** and **5**. The conducting elements may be retained in assembled relationship with the insulating member **2** by non-conducting clamping members **7** and **8** and a bolt or rivet **10** which passes through the clamping and insulating members **8**, **2** and **7** and also through apertures in the conducting elements **4** and **5**. The insulating spacer member **2** may be provided with projections **13** and **14** which extend through the apertures of the conducting elements **4** and **5** and into appropriate recesses **17** and **18** of the clamping and insulating members **7** and **8**, so as to maintain the conducting elements **4** and **5** electrically spaced from the shank of the rivet or bolt **10**.

One or both of the conducting elements **4** and **5** is preferably of some suitable resilient material so formed or stressed that their normal tendency is to spread apart from each other, in the absence of the interconnecting fuse link **22** shown joining them together adjacent their free ends. Electric wires **25** and **26** may be connected in any suitable manner with the conducting elements **4** and **5** so that these latter elements and their interconnecting fuse link **22** form a portion of a first or primary electric circuit. Any appropriate means may be provided for securing the fuse link to the resilient conducting elements **4** and **5**, for example, retaining screws **28**.

Intermediate its ends, and intermediate the fuse link **22** and insulating member **2** and clamps **7** and **8**, each of the conducting elements **4** and **5** carries an electrical contact **30** and **31**, these contacts being registrable with each other so that when the conducting elements **4** and **5** are in the relationship illustrated in Fig. 1, current may flow, for example, from wire **35** to wire **36** through soldering lug **38**, shank **39** of contact **30**, shank **40** of contact **31** and soldering lug **41**. Thus the contacts **30** and **31** cooperate with associated parts to form a portion of a secondary circuit.

The contacts **30**, **31** and their associated electric conducting parts may be maintained in spaced relationship from the resilient conducting elements **4** and **5** by insulating members similar to those previously described in connection with the mounting of the resilient conducting members. For example, the shanks of contact members **30**, **31** may extend through apertured insulating members **46**, **47** (conducting element **4**) and **48**, **49** (conducting element **5**), which are provided with portions that extend into apertures of the conducting elements **4**, **5** and into recesses of the illustrated outer insulating members **46**, **49**. While the contact members **30**, **31** are shown as bolts, it will be clear that they could be rivets or otherwise.

It will be noted that one of the insulating members **47** is provided with a projection or lip **50** that overlaps a portion of the adjacent insulating member **48**, thus forming a barrier or shield between the contacting surfaces of contacts **30**, **31** and the fuse link **22**. This construction is desirable as it minimizes the possibility of material from a melting fuse link **22** splattering onto adjoining surfaces of the contacts **30**, **31** and also minmizes the possibility of ionizing atmosphere contributing to arcing between the contacts **30**, **31**, this ionizing atmosphere being formed upon melting of the fuse link and separation of the conducting members **4** and **5**.

Under conditions of normal operation the relationship of the parts of the present device is as illustrated in Fig. 1. When an excessive current flows and melts the fuse link **22**, the conducting elements **4** and **5** spring apart to the general relationship illustrated in Fig. 2. Due to the resiliency of the conducting elements the fuse link **22** is maintained under tension at all times. A new fuse link may be readily applied by removing the screws **28** and fuse fragments and thereafter pressing the conducting elements **4** and **5** toward each other to facilitate fitting a new fuse link into position and screwing it to these elements.

It will be clear that the various parts of the present device may be of any desired dimensions so as to form devices of various desired sizes. The device may be enclosed in any suitable container or "fuse box."

While the preferred embodiment of the present device is the relatively simple, inexpensive and "foolproof" form illustrated in Figs. 1–2 and described hereinabove, under some circumstances it may be desirable to utilize a form of the invention such as illustrated in Fig. 3. As there shown, the device is disposed within a container 60 of non-conducting material and comprises a stationary

conducting element or terminal 61, an element or terminal 62 carried by a movable non-conducting member or block 63, and an interconnecting fuse link 67 joined therewith, for example, by conducting screws 64 illustrated adjacent opposite ends of the fuse link. The conducting elements 61, 62 and the fuse link 67 cooperate with a wire 68 to form a portion of a primary or master circuit. The movable non-conducting member 63 which carries the conducting element 62 is preferably provided with apertures into which extend guide pins 70, 71 that are secured to the container 60; a partially compressed spring 72 normally urges the non-conducting member 63 and conducting element 62 away from the conducting element 61, so that upon passage of overload current through the primary circuit the fuse link 67 melts and spring 72 moves the member 63.

Movement of the non-conducting member 63 serves to interrupt one or more secondary circuits. As shown in Fig. 3, two secondary circuits are interrupted. One of these secondary circuits comprises a contact 75 which connects with a wire 76 through its shank portion and also bears against a contact 77; another of the secondary circuits comprises a contact 80 which connects through a shank portion with a wire 81 and also bears against a contact 82. Upon overloading and melting of the fuse link 67, the spring 72 moves the non-conducting block 63 along the guide pins 70, 71 and simultaneously moves the contacts 75, 80 away from their cooperating adjacent contacts 77, 82, respectively; while the block 63 could come to rest against any suitable stop, in the illustrated embodiment of Fig. 3 it is adapted to move auxiliary contacts 75' and 80' into contact with "back" contacts 84 and 85. This construction is desirable in instances where it is appropriate to establish one or more "new" secondary circuits upon interruption of one or more previously existing secondary circuits. Electrical connections may be made externally with the device by connecting leads to the posts or prongs 61 shown projecting from the container 60.

It will be seen that the present invention provides a new and improved device of relatively simple and inexpensive construction that is adapted to interrupt one or more secondary circuits practically simultaneously with opening of a primary or main circuit, thus eliminating objectionable time lag between opening of a primary circuit and opening of a secondary circuit. No solenoids or relays are required and hence there are obviated objections such as slow magnetic field decay and slow action response which usually accompany devices that embody such parts. The moving parts of the device may be of relatively light weight and hence there is no objectionable delay due to inertia of parts. The device is of rugged construction and well adapted to withstand rough usage to which it may be subjected.

As various changes may be made in the form, construction and arrangement of the parts herein without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a device of the character described, the combination of means including a pair of conductors at least one of which normally tends to move away from the other but adapted to be maintained in conducting relationship with each other by an interconnecting fuse link, means including a pair of conductors and cooperating contacts carried by but electrically insulated from said first mentioned pair of conductors, and shielding means carried by a conductor of said first mentioned pair and disposed intermediate said fuse link and said cooperating contacts, said contacts being normally in contact with each other when the conductors of the first mentioned pair are in said conducting relationship and being separable from each other upon weakening of said fuse link and movement of one of said first mentioned conductors away from the other.

2. A device as claimed in claim 1, in which said fuse link is carried by the first mentioned pair of conductors adjacent one end thereof, said contacts are carried by the first conductors at facing surfaces thereof and at a location adjacent the fuse link, and the shielding means is disposed intermediate said facing surfaces of the conductors.

3. A device of the character described comprising the combination of an insulating member, a pair of electrically conducting leg elements secured to said insulating member and maintained in spaced relationship thereby, at least one of the leg elements being of resilient material and normally tending to diverge from the other in opposition to an interconnecting fuse link, an electrically conducting fuse link normally interconnected in series with said leg elements at a location spaced from said insulating member retaining the leg elements in adjacent relationship in opposition to the resilience of said one leg element and forming therewith a portion of an electric circuit, insulating elements carried by said leg elements at locations generally opposite each other, electrically conducting terminal members carried by said insulating elements and normally maintained in contact with each other by said leg elements and said interconnecting fuse link to form a portion of a second circuit, said terminal members separating from each other to interrupt said contact and second electric circuit substantially simultaneously with interruption of the first mentioned circuit upon weakening of the fuse link and divergence of said resilient leg element from the other leg element.

4. A device of the character described comprising the combination of an insulating member, a pair of electrically conducting leg elements secured adjacent end portions thereof to said insulating member and maintained in spaced relationship thereby, said leg elements being of resilient material and normally tending to diverge from each other in opposition to an interconnecting fuse link, an electrically conducting fuse link normally interconnected in series with said leg elements adjacent end portions thereof opposite the first mentioned end portions retaining the leg elements in adjacent relationship in opposition to the resilience thereof and forming therewith a portion of an electric circuit, insulating elements carried by said leg elements at locations intermediate the fuse link and insulating member and disposed generally opposite each other, electrically conducting terminal members carried by said insulating elements and normally maintained in contact with each other by said leg elements and said interconnecting fuse link to form a portion of a second circuit, said terminal members separating from each other to interrupt said contact and second electric circuit substantially simultaneously with interruption of the first mentioned circuit upon weakening of the fuse link and divergence of said resilient leg elements from each other.

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